United Nations E/CN.17/1998/6

Economic and Social Council

Distr.: General
5 March 1998

Original: English

Commission on Sustainable Development
Sixth session
20 April-1 May 1998

Capacity-building, education and public awareness, science and transfer of environmentally sound technology

(Chapters 34-37 of Agenda 21)

Report of the Secretary-General

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I. Introduction

1. The present report consists of brief summary reports prepared on four separate chapters of Agenda 21 by their respective task managers.[1] It has been prepared in response to the decision of the General Assembly at its nineteenth special session, in 1997, to include in the multi-year programme of work of the Commission on Sustainable Development capacity-building, education and awareness-raising, science, and transfer of technology as a cross-sectoral theme for consideration by the Commission in 1998. Each section of the report provides a brief status update and a series of proposals for further action. In addition, more detailed information is provided in addenda to the present report or in background papers made available by the task managers. This additional information is referred to in the relevant section of the report.

II. Cooperation for capacity-building: chapter 37 of Agenda 21*

A. Capacity-building for sustainable development: the state of the art

2. As task manager, the United Nations Development Programme (UNDP), submitted its first report on capacity-building in 1993, followed by updates in 1995, 1996 and 1997. Its current report has two main themes. First, the cautious optimism evident in the 1997 report continues. Although enormous constraints to the achievement of effective capacities to promote sustainable development remain, genuine signs of progress are evident. Moreover, such signs can be seen across the globe from small countries such as Burkina Faso to large ones such as China and from low-income countries such as Bolivia to middle-income ones such as Morocco. It now seems apparent that people can make progress on capacity-building towards more sustainable livelihoods wherever they live, providing they receive support and encouragement. Second, this report gives greater attention to issues of implementation and action. At present, most countries have strategies for either environmental management or sustainable development, and the global community has a reasonable sense of what needs to be done with respect to capacity-building for sustainable development. The main challenge now lies in implementation – learning to use capacities that already exist, developing new ones and building the trust, incentives and willingness to collaborate.

3. The main trends that have emerged in capacity-building in the past several years are summarized below. The emphasis here is on the structures, ideas, values and behaviour that encourage implementation of the many strategies, including national sustainable development strategies, national environmental action plans and national conservation strategies that have been formulated over the past decade:

(a) There has been a decline of "command and control" approaches by state agencies in the public sector. There is much greater recognition that resource protection policies enforced by central agencies have, in many cases, led to local resistance, dysfunctional incentives and unsatisfactory service levels;

(b) A more decentralized approach to resource management has emerged, which relies upon less proscription and more responsiveness to the actual social and economic context of people's livelihoods;

(c) There has been an increase in partnerships and multi-agency networks among public agencies, non-governmental organizations, community groups and private profit firms. Such arrangements are an attempt to provide the collaboration and coordination that has proved extremely difficult to achieve under the old centralized hierarchical arrangements;

(d) There is now greater use of market-based incentives, including changes in resource pricing, tax policy and revenue distribution;

(e) There is a trend to much greater participation and citizen empowerment through different organizational arrangements, education and awareness campaigns and greater democratization. The impetus for capacity development is becoming as much demand-led as supply-driven;

(f) There is a greater involvement of local and municipal governments and their ability to provide integration at the micro level is increasing;

(g) There is a much greater willingness to experiment with new approaches to capacity development and to consciously learn from experience. This shift includes getting access to global learning through electronic networks.

4. Elements of this package of reforms can be seen in many countries. The challenge now is to combine this complex policy and organizational mix at the local, national

* Additional information is provided in a background document circulated separately by the task manager.

and international levels into a critical mass that can lead to significant changes in human behaviour.

B. Relationship to sustainable development planning

5. Most countries remain at an early stage of trying to achieve a more coordinated approach to sustainable development planning. Some of the more promising approaches are the following:

(a) Most countries have focused their capacity efforts with respect to sustainable development on environmental issues, with the intention of including sectors involving education, population, industry, tourism, energy and agriculture at a later date. Making the transition from an environment-focused approach to one that is more inclusive will be one of the continuing challenges in the years ahead;

(b) Many countries have embarked upon a broad process of national consultation involving a wide range of stakeholders from both outside and inside Government. Niger has established a National Council on Environment and Sustainable Development, which conducted a national forum in September 1997. Bhutan, Bolivia, Burkina Faso, Estonia, Jordan, Kyrgyzstan, Mongolia, Morocco, Pakistan, Peru, the Philippines and the United Republic of Tanzania all have similar processes to encourage dialogue among diverse interests. Creating a real national consensus behind sustainable development seems critical to providing the support and energy to drive the implementation process;

(c) It appears to be easier to achieve more coherent approaches to sustainable development planning at the local, municipal and regional levels where the presence of less entrenched organizations, the closer scrutiny of citizens and the entry of a younger generation of leaders into positions of authority is leading to progress. The next task will be to ensure greater support of local initiatives by central authorities, for example, by using co-management approaches to resources management.

C. Priorities for action at the country level

6. Several areas are emerging as key priorities at the country level:

(a) Opening up the process of capacity-building to include a full range of national actors seems to be a critical first step either through decentralization, State-civil society partnerships, privatization or consultative approaches. Without this greater level of participation, the older, formal structures of Government cannot, by themselves, provide the energy, creativity, insights and resources that are critical to developing the capacities for sustainable growth;

(b) Most countries are now engaged in some form of public-sector reform designed to make Governments more responsive and cost effective. Greater attention needs to be paid in these reform efforts to shifting the role of central Governments – making them more oriented towards setting broad frameworks within which other non-state actors can take responsibility for programme implementation and service delivery;

(c) Capacity development for sustainable development is more than a financial or technical or organizational activity. It clearly requires that countries embed some of the "rules of the game" in legal covenants to ensure compliance and guidance for national participants. Reform of the judicial system is also a priority in many countries;

(d) Implementation of capacity-building needs effective monitoring and evaluation to provide learning and lessons of experience. This, in turn, requires approaches to monitoring and evaluation that are less donor-driven, less defensive and more attuned to the learning needs related to capacity-building.

D. Recommendations

7. The Commission on Sustainable Development could lend its support and encouragement to the process in the following ways:

(a) **The international community should reinforce the idea that countries at any level of development can make genuine progress in building their capacity for sustainable development, provided that the process is driven by national commitment and ownership.** The growing effort in many countries to involve a wide range of participants is one of the most encouraging trends to date;

(b) **Funding agencies should give greater support to capacity-building activities.** The African members of the Board of Governors of the World Bank have persuaded the Bank to move in this direction and other donors should be encouraged to do so in specific operational ways. **Increased support should also be complemented by continuing the shift in funding agency interventions – that is, less direction and control, greater orientation towards facilitation and support and more non-project funding;**

(c) **Countries should learn from each other's experiences and adopt approaches moving away from command and control techniques and towards more experimentation, as in the case of the Beijing Watershed Development Programme. Governments need to move towards greater transparency of information.** In the region, covered by the Economic and Social Commission for Asia and the Pacific, exchange of information is a key component of a poverty alleviation programme designed to enhance the incomes of the rural poor by replicating successful micro-enterprises, which is currently being implemented in eight countries. **Funding agencies should devote more resources to activities in support of learning, including case studies for practitioners, more action-oriented research and the continued support for electronic networks that can link groups around the world;**

(d) **Countries should seek to increase their own capacity through subregional cooperation in cost-effective ways.** Capacity-building programmes are increasingly an integral part of subregional cooperation programmes. Good examples of subregional capacity-building programmes can be found in the Caribbean, South Pacific and North-East Asia regions.

III. Education, public awareness and training: chapter 36 of Agenda 21

A. Current status and trends

8. The first report on education, public awareness and training was submitted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) to the Commission on Sustainable Development at its fourth session, in 1996. At that time, a special work programme was initiated, in which priorities for action and key actors were designated. The nineteenth special session of the General Assembly gave added impetus to the implementation of chapter 36 of Agenda 21. The information provided below includes an expanded version of the work programme initiated in 1996. Additional information on the issues addressed in the present section is contained in document E/CN.17/1998/6/Add.2.

9. There is growing recognition within political and economic circles of the critical role of education as part of the enabling framework for sustainable development. Education is now widely acknowledged as a means to prepare people to engage with Governments, business and industry, to support changes in governance and the marketplace and to adapt to a complex and rapidly changing world. Ministries of finance and planning, as well as other sectoral ministries, are increasingly targeting education as an underpinning for solving economic, social and political problems. Education is recognized as a driving force for changing values and mind sets, which can in turn lead to behavioural change. Education is an integral element in debates on such key issues as poverty, population, health, employment, environmental management, consumption and production, and technology transfer, all of which are essential ingredients of sustainable development.

10. It is increasingly recognized that sustainable development encompasses all disciplines, and requires that education acknowledge the disciplines in their relationship to each other, engaging all levels and forms. Education does not mean formal education alone. It includes non-formal and informal modes of teaching and learning, such as those that take place in the home and community.

11. The purpose of the background document entitled "Educating for a sustainable future: a transdisciplinary vision for concerted action", is to provide a conceptual framework and serve as the basis for regional strategy papers or action programmes. The International Conference on Environment and Society: Education and Public Awareness for Sustainability, co-organized by UNESCO and the Government of Greece in Thessaloniki in December 1997, addressed this issue, as did numerous other meetings held during 1997 to celebrate the twentieth anniversary of the Tbilisi Intergovernmental Conference on Environmental Education, including the Conference PlanetERE, held in Montreal, Canada, in 1997 for francophone countries.

12. To accelerate progress towards sustainable development, emphasis has been shifting to action at the national and local levels. An important theme continues to be the inadequacy of financing for education, despite the consensus among Governments of its importance. This evolution has important implications for how institutions orient their work and for the allocation of resources. The United Nations system, for example, is working to improve the coordination of services at the country level. To support this, UNESCO is launching an inter-agency initiative on education for a sustainable future in a number of countries.

13. The creativity and risk-taking required for innovation in educational institutions and for meeting new challenges, are diminished by downsizing, reductions in resources and heightened competition. Moreover, experience has shown that partnerships in the abstract tend to divert energy and resources without delivering concrete results. The increasing

emphasis on work at the country level is expected to help focus joint efforts, since alliances and partnerships tend to be most effective when they are centred on concrete initiatives where the contribution of each partner is essential to achieving common and concrete goals.

B. Action required

14. Further to the programme of work on education and public awareness adopted in 1996, the following subprogrammes and partnerships in implementation are presented below for further consideration. Once agreed, progress made in implementing the work programme should be monitored on a regular basis.

1. Clarifying the concept and key messages of education for sustainable development

15. The concept and key messages must be further developed and implanted at the regional and national levels by:

(a) Preparing regional education strategy papers, which would in turn be taken up at the national level;

(b) Analysing the action plans of all the major United Nations conferences, the conventions on biological diversity, climate change and desertification, the Agenda for Development (General Assembly resolution 51/240), and regional action plans for sustainability, with a view to promoting the integrated follow-up to those agreements with respect to education and public awareness under the umbrella of chapter 36;

(c) Formulating the core messages of education for sustainable development that need to be communicated at all levels of education and through all channels, and mobilizing diverse networks of experts to that end.

16. Governments and the media are encouraged to undertake information campaigns to communicate to the public the key messages of sustainable development. Governments should provide incentives to the media for this purpose.

2. Reviewing national education policies and reorienting formal educational systems

17. Governments are urged to develop, within five years, policy statements for reorienting education towards sustainable development, including a definition of what needs to be done at the local, national and regional levels, so that all actors will understand their respective roles and responsibilities. The participation of local authorities and other local actors in this process should be ensured. The United Nations system, governmental and non-governmental organizations and the education and scientific communities are called on to provide assistance to this endeavour.

18. Priority needs to be given to teacher training in reorienting formal education systems. The approximately 60 million teachers worldwide need to be engaged in this process. Governments are urged to ensure that within five years measures have been taken in this direction. International and national representatives of teachers (including unions) should be involved, as well as specialists in higher education.

19. Institutions of higher education should adapt their teaching and research to promoting an interdisciplinary approach conducive to addressing sustainable development issues. Governments and the academic community are urged to support this process. The World Conference on Higher Education in 1998, and its follow-up, should give due consideration to the reform of higher education systems to support sustainable development. Likewise, the World Science Conference in 1999 should consider how to ensure that educational reform draws on scientific knowledge and how to integrate knowledge emanating from the disciplines in the service of sustainable development.

20. In view of the long-term implications of educational reform, Governments need to ensure the continuity required for reform efforts to be fully implemented. Progress made in this regard should be regularly monitored at the international level.

3. Incorporating education into national strategies and action plans for sustainable development

21. Education and public awareness should be made significant components in regional, national and local strategies and plans for sustainable development. Governments, working with civil society, the private sector, the education community and others need to ensure such integration. National and local governments are encouraged to establish national and local committees for this purpose, which should be interdisciplinary, involve all sectors, and ensure the full participation of both governmental and non-governmental bodies. The United Nations system, in partnership with other key international institutions, should be called upon to assist in the integration of educational concerns into such

strategies and plans at the country level. A survey of existing regional and national strategies and plans to determine the extent to which education has been adequately addressed, initiated by UNESCO, in cooperation with the Department of Economic and Social Affairs of the United Nations Secretariat and UNDP, should be completed and recommendations developed on that basis.

4. Educating to promote sustainable consumption and production patterns

22. Initiatives are needed to link the work programmes on education and on changing consumption and production patterns. Such initiatives could include raising awareness of the implications of current unsustainable patterns of consumption and production; dissemination of the revised guidelines for consumer protection; partnerships with industries and the media to work out strategies for advertising; making use of educational tools and consumer feedback mechanisms to facilitate policy-making; and developing and promoting social instruments through education and training intended to change consumption and production patterns. The task managers for chapters 4 and 36 of Agenda 21 (Department of Economic and Social Affairs of the United Nations Secretariat and UNESCO), working together with other relevant organizations, including the United Nations Environment Programme (UNEP), the Organisation for Economic Cooperation and Development (OECD), and representatives of business and industry, should develop concrete recommendations for initiatives along these lines.

5. Analysing and redirecting investments in education

23. The proposed review by the international financial institutions on current investment in education from the perspective of sustainable development should also consider financing by Governments and by major groups. Based on such a review, a strategy for mobilizing greater resources to finance education from all sources should be developed.

6. Identifying and sharing innovative practices

24. It is important to continue to identify and share innovative practices in support of education and public awareness for sustainability, at the local, national, regional and international levels. An international electronic registry is being developed by UNESCO, with the assistance of the Government of the United States of America, to address this need by establishing a second generation Web site and a knowledge management system for chapter 36 of Agenda 21. Innovative case studies from non-conventional sources, such as various major groups including industries, women, youth and non-governmental organizations, should be included in such an inventory. Regional networks and forums for sharing innovative practices should be encouraged.

7. Partnerships in implementation

25. The following are some ways in which partnerships can be further strengthened:

(a) Public-private cooperation should continue to be enhanced for launching effective education and training of workers, as well as for undertaking public awareness campaigns, including through the media and through advertising, with a view to promoting sustainable consumption and production patterns and the use of environmentally sound technologies, and to communicating other key issues of sustainable development;

(b) The involvement of the scientific and technological community in enriching education, training and awareness-raising programmes needs to be enhanced, particularly to promote the understanding of crucial sustainable development issues of concern at the local and national levels;

(c) Youth have been important advocates for sustainable development, especially at the community level. Innovative programmes such as the youth indicators programme should be identified and encouraged and new ones developed. At the same time, they should be made part of national dialogues and decision-making on education;

(d) Women, especially in rural communities, usually play a key role in the economic as well as in the social and cultural aspects of life. The local community and the household are important entry points for messages on sustainable development, especially for adults and out-of-school children. Programmes to strengthen the role of women in these contexts should be promoted;

(e) Non-governmental organizations are critical partners in catalysing action and awareness-raising for advancing sustainable development and mobilizing civil society to take initiatives in their communities. The role of non-governmental organizations at the national and local levels is growing exponentially and their innovative practices should be widely disseminated.

IV. Science for sustainable development: chapter 35 of Agenda 21

A. Sound scientific knowledge

26. The first report prepared by UNESCO on science for sustainable development was submitted to the Commission on Sustainable Development at its third session, in 1995. Implementation of the different sectoral and cross-sectoral chapters (e.g., freshwater and health) of Agenda 21 must be based on sound scientific knowledge. Consequently, the specific monitoring, research, training and institution-building requirements for dealing with these specific environment and development issues form an integral part of the implementation of those chapters. More detailed information on the issues addressed in the present section is contained in document E/CN.17/1998/6/Add.3 and in a background paper entitled "Report on international scientific advisory processes on the environment and sustainable development"

B. Training, capacity-building and education in science

27. Each country must possess the scientific capability needed to master its own path to sustainable development. Given that the majority of developing countries today fall short of this objective, their national investment in higher education in science and in scientific institution-building should be significantly increased. Specific attention should also be given to capacity-building related to the development and implementation of national science and technology policies and systems of innovation. In this context, strong and concerted international support to build up the scientific community and scientific infrastructures in developing countries, in particular the least developed countries, is an urgent requirement.

28. Science education, in the larger sense of the term, continues to be neglected and should be reinforced in all school curricula and at all levels of society in developing and industrialized countries alike. Activities aimed at strengthening science education at the national and international levels are *ipso facto* related to the broader issue of education, awareness-raising and training for sustainable development (chapter 36 of Agenda 21) and should be developed through close cooperation between scientific and educational institutions and departments.

C. Improving scientific knowledge for sustainable development

29. There is already a solid foundation of knowledge for most "development and environment" issues included in Agenda 21, but it is equally true that for almost all these issues great gaps in knowledge remain. Predominantly disciplinary research within the key problem areas needs to be complemented by a holistic interdisciplinary approach to research. Moreover, research needs to become more pro-active and to focus on prevention and early identification of emerging problems – and also opportunities – rather than on tackling problems only when they become acute, as it does at present. Poverty reduction should also be another priority for research on sustainable development.

30. The allocation of national funding to sustainable development research is woefully insufficient. Another unsettling fact is that financial support for international scientific cooperation programmes is stagnating or, in some cases, even diminishing. This reduces in particular support for developing country participation in these activities.

D. Strengthening international cooperation in long-term observations and the free exchange of data and information

31. Reducing scientific uncertainty requires long-term observations of both natural and man-modified systems. Long-term systems observations are also essential to be able to assess the causes and the extent of change, as well as the impact of remedial measures. Under the umbrella of Earthwatch, coordinated by UNEP, the relevant organizations have started to develop the scientific foundations for comprehensive global observing systems for the major components of the Earth system: the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS) and the Global Terrestrial Observing System (GTOS). Cooperation between the three systems is promoted through a Joint Sponsors Group consisting of UNEP, the World Meteorological Organization, UNESCO and its Intergovernmental Oceanographic Commission, the Food and Agriculture Organization of the United Nations, the World Health Organization and the International Council of Scientific Unions (ICSU).

32. The fully fledged development and the long-term sustainability of these observation systems is at present far from assured owing to the shortage of both international core

funds and support for national and regional activities contributing to the observing systems. In fact, there is at present even a decline in the existing national and regional monitoring activities and networks due to lack of appropriate funding, including in many industrialized countries.

33. Development of international observing systems and resulting databases as well as scientific advances in general rely on full and open access to data. A market model for access to data and information is unsuitable for science in general and international scientific cooperation in particular.

34. New information systems and communication technologies hold the promise of offering rapid, worldwide access to scientific resources, but it will be a major challenge to convert this promise into reality. The investment in telecommunication systems and networking services that is required to provide open access to these electronic networks is currently well beyond the reach of many developing countries, particularly the least developed countries.

E. Knowledge-based policies and action: the role of international scientific advisory processes

35. A precondition for providing the best scientific advice available on major international environment and development issues is the conducting of comprehensive assessments of the scientific knowledge available on the issues in question. An analysis of existing international scientific advisory processes is provided in the background paper entitled "Report on international scientific advisory processes on the environment and sustainable development", prepared by a UNEP consultant, in consultation with UNESCO. A summary of the policy issues addressed in that report is provided in document E/CN.17/1998/6/Add.3.

36. Several general conclusions can be drawn from the above. First, the modality of providing scientific advice needs to be carefully selected to suit different requirements in different contexts. Second, the best scientific advisory processes are those that combine scientific excellence and intellectual independence with a close dialogue and cooperation with policy makers and implementers, as in this way only can the concerns and needs of the recipients of scientific advice be adequately addressed. Third, there is considerable risk of duplication in the work of existing international scientific advisory bodies. Fourth, efforts need to be enhanced to ensure full participation by experts from developing countries, including, if necessary, through "on the job" training and other capacity-building measures. Fifth, although the Internet represents an invaluable source of information, in no way can it replace the scientific work done at present through scientific assessments and scientific advisory bodies.

F. Proposals for action

37. **Countries, in particular developing countries, should define national strategies, policies and plans for the purpose of ensuring the development of scientific, capacity for the benefit of sustainable development, the management of science, including improved research management, the integration of science in national sustainable development plans and national participation in high priority international scientific endeavours. Special emphasis should be placed on ensuring an equal opportunity for women in science.**

38. **In order to address the shortcomings of higher education in science in many developing countries, in particular those in Africa and the least developed countries, measures to be taken should include:**

(a) Undertaking a comprehensive rehabilitation of research and teaching infrastructures in universities, and their proper re-equipping as a critical precondition for the development of capacity in science and technology, including the provision of the necessary funds from national sources;

(b) Incorporating support for higher education and relevant research in the funding for technical assistance programmes in the broad field of environment and sustainable development;

(c) Bilateral and multilateral donor cooperation within each country and for regionally organized postgraduate training programmes and South-South training and research programmes;

(d) Establishing university-industry partnerships;

(e) Putting in place modern information technologies so as to ensure easy access to the resources of libraries and documentation centres.

39. **Specific programmes should be developed and/or reinforced in industrialized and developing countries alike to strengthen science education for all groups of society, not only at the primary and secondary levels of formal education, but also in the context of informal education.**

40. **Predominantly disciplinary research within the key problem areas should be complemented by a holistic**

interdisciplinary approach to research. Moreover, research must become more action-oriented and proactive with a greater focus on prevention and early identification of emerging problems – and also opportunities – rather than its present focus on solving problems only once they have become acute. Action-oriented interdisciplinary scientific programmes for sustainable development, sponsored by several United Nations agencies, should receive enhanced support.

41. Long-term observations of the environment are essential in order to be able to improve knowledge leading to better management of the global observing systems and to assess change and the impact of policy measures. Governments of industrialized and developing countries alike should join forces with international organizations and the scientific community to develop global environmental observing systems related to climate, oceans and terrestrial ecosystems. Governments of developed countries should ensure that these endeavours receive adequate international core funds.

42. Both scientific databases established with public funds and data exchanges for the purposes of scientific work should be exempt from commercial regulations. Scientists and other users worldwide should continue to enjoy free access to scientific databases from all sources in exchange for a modest contribution towards the cost of producing and communicating a specific set of data.

43. The Commission on Sustainable Development may wish to invite UNEP, in cooperation with UNESCO and other United Nations agencies and international scientific organizations as well as the secretariats of the conventions concerned, to prepare proposals for improved coordination and cooperation among scientific and technical advisory bodies to these conventions.

44. Pursuant to the decisions of the governing bodies of UNESCO and ICSU to jointly organize in June 1999 a World Science Conference, in cooperation with other United Nations agencies and international scientific organizations concerned, the greatest attention should be given by the Conference and during its preparatory process to addressing the key issues of science for sustainable development. Science must be given a boost as it is no exaggeration to assert that without enhanced science there can be no sustainable development.

45. Governments in developing and developed countries alike should take appropriate measures to mobilize increased investment in research and development at the national level, with a focus on science for sustainable development. Multilateral and bilateral donor agencies and Governments should step up significantly their support for developing countries in this regard. Increased financial support should also be provided to relevant international scientific cooperation programmes.

V. Transfer of environmentally sound technology: chapter 34 of Agenda 21*

A. Technology transfer and sustainable development

46. Technology is critical to economic growth and sustainable development. The development and dissemination of new and improved technologies contributes to the increased production and introduction of goods and services, and to production processes that are more resource efficient and less polluting. In general, however, increases in the volume of production and consumption are outpacing the introduction of cleaner technologies, contributing to continued deterioration of the global environment.

47. Sustainable development requires accelerated development, transfer and dissemination of both cleaner technologies for existing production and consumption patterns, and innovative technologies that meet people's needs in new and more sustainable ways. In particular, sustainable development on a global basis requires accelerated transfer of environmentally sound technologies from developed to developing countries.

48. While business and industry play a crucial role as responsible entrepreneurs in the development and transfer of environmentally sound technologies, Governments still have a major role to play in setting the policy framework and providing incentives for business and industry to contribute to sustainable development on a global basis. Making eco-efficiency a management objective in business planning and operations is an important step towards sustainable development and may require substantial changes in business strategies. In order to promote improvements in eco-efficiency, there is a need for further development of measurement methods, environmental performance indicators and technology benchmarking, including the assessment and adoption of new and cleaner technologies.[2]

* For more detailed information, see document E/CN.17/1998/6/Add.1.

49. Government policies need to be based on a thorough understanding of the factors influencing companies' environmental and economic performance, including their adoption of best practices in environmental management and use of environmentally sound technologies in production processes.

50. Small and medium-sized enterprises, in particular, have come under pressure from consumers, client enterprises and environmental regulations to improve environmental performance, but often have difficulties meeting these requirements. Small and medium-sized enterprises should be supported by national and local authorities and should have access to consultants and researchers who can assist in applying eco-efficiency in business strategies, planning and operations. Networks of organizations and experts that can assist small and medium-sized enterprises need to be established. The European Roundtable on Cleaner Production is a step towards creating such a network in Europe, and similar initiatives should be undertaken in other regions.

51. Cooperative arrangements among chambers of commerce and other business and industry organizations in developed and developing countries could help in spreading best practices, including training in technical skills and know-how, management practices and the use of new management tools, and institutional cooperation. Programmes such as Asia EcoBest, developed by the Regional Institute for Environmental Technology in Singapore is an example of successful cooperation.

B. Policies for promoting the transfer of environmentally sound technologies

1. Strengthening technology cooperation

52. The Technology Cooperation Workshop, organized by the United Kingdom of Great Britain and Northern Ireland under the auspices of the Advisory Committee on Business and the Environment,[3] suggested that there is a need for the development of guidelines or codes of practice for Governments on technology cooperation. Such guidelines or codes of practice should identify, based on existing experience and emerging opportunities, areas for government policy interventions to promote technology partnership initiatives between economic actors in developed and developing countries and to remove obstacles to such initiatives. There is a need to identify the potential actors, including Governments, business and industry, research and development institutions and technology centres, and to examine their respective roles, specific interests and priorities in technology partnership initiatives.

53. Technology partnership initiatives should take into account economic opportunities and the capacities of the developing country partners for technology integration, management and dissemination. They should be designed to include the transfer and adaptation of specific production technologies, long-term capacity-building and cooperation in further research and development. The economic, environmental and cultural context of the partners from developing countries should be considered in selecting the technologies to be transferred.

54. There is a need for further study of the effectiveness of various incentives and economic instruments for attracting the participation of private sector companies from developed countries in technology partnership initiatives with developing country partners.

55. Finally, mechanisms and tools must be developed to monitor and measure the effectiveness of technology partnership initiatives for achieving specific economic, social and environmental goals and targets as defined by the partners.

2. Increasing the transfer and dissemination of environmentally sound technologies resulting from publicly funded research activities*

56. The International Expert Meeting on the Role of Publicly-funded Research and Publicly-owned Technologies in the Transfer and Diffusion of Environmentally Sound Technologies, organized by the Republic of Korea, concluded that Governments can play a considerable role in the establishment of an institutional framework within which the identification, assessment, transfer, adaptation and post-transfer follow-up of environmentally sound technologies can take place, in particular in the case of environmentally sound technologies resulting from publicly funded research activities. Building and strengthening cooperation between information systems, national cleaner production centres, centres for innovation and enterprise development, and other intermediaries would be a necessary step in establishing such a framework.

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* This section is based on the report of the International Expert Meeting on the Role of Publicly-funded Research and Publicly-owned Technologies in the Transfer and Diffusion of Environmentally Sound Technologies, Kyongju, Republic of Korea, 4-6 February 1998 (see E/CN.17/1998/12).

57. The Expert Meeting also concluded that the transfer and dissemination of publicly funded environmentally sound technologies generally takes place through existing technology transfer mechanisms, including intra-enterprise transfers (direct investment), joint ventures, environmentally sound technology licensing arrangements, and agreements between developing and developed country enterprises or research institutions to jointly develop and commercialize environmentally sound technologies.

58. Moreover, many technological innovations, including most of those that result from publicly funded research activities, are not patented or commercialized by their developers, but are published in technical literature. This knowledge is freely available for commercialization by enterprises with the necessary capacity.

59. Based on the work of the Expert Meeting, the policy options set out below might be considered by the Commission on Sustainable Development for further action.

60. **Governments of developed countries should provide incentives to accelerate the transfer and dissemination of publicly funded environmentally sound technologies to developing countries, including tax incentives, promotion of environmentally sound technology-related imports, and technology transfer in exchange for intellectual property protection.**

61. **Governments, with the support of international organizations and financial institutions, should support small and medium-sized enterprises, including through funding of feasibility studies on market opportunities and commercial viability of environmentally sound technologies, fiscal incentives such as lower taxes or tax holidays, export promotion programmes such as trade missions targeted towards environmentally sound technologies, and assistance in the development of business plans.**

62. **Business risks for environmental enterprises should be reduced, for example through various types of financial assistance such as grants, venture capital investments underwritten by Governments and loan guarantee schemes.**

63. **Governments and international organizations should support and encourage pilot and demonstration projects related to the use of environmentally sound technologies in developing countries.**

64. **Governments, with the support of international organizations, should develop new mechanisms for the sharing and exchange of environmentally sound technologies, such as bilateral and multilateral memoranda of understanding and environmentally sound technology pooling or banks. Further studies of mechanisms for improving the dissemination of environmentally sound technologies should be encouraged.**

65. **Governments should promote the transfer to developing countries of non-patented or uncommercialized technologies resulting from publicly funded research activities, including through technology cooperation. Transfer of such knowledge can contribute to capacity-building in developing countries as well as to the use of these results.**

66. **Governments should promote joint research and development activities between institutions in developed and developing countries in order to strengthen capacity-building and training, and encourage the sharing of the results of joint research and development activities, including joint patenting.**

3. Developing national technology strategies

67. **National strategies for technological development are an important element of development strategies. They should be targeted towards strengthening national technological research and development capacities and improving the capacity for technology transfer, integration and dissemination.**

68. **Governments of developing countries should be encouraged and supported in their efforts to focus technology strategies on industries that are particularly important with respect to economic growth, natural resource consumption and environmental pollution.** The objective should be to identify areas where a country's development "opportunities" match its national "capacities" for technology innovation, integration and dissemination, and areas where technology cooperation is needed to bridge the gap between "opportunities" and "capacities". In defining a technology development strategy, it is important to take into account the different interests and capacities of various stakeholders.

69. **Regional expert group meetings, jointly organized by Governments and United Nations agencies, can be a useful mechanism to develop guidelines or manuals, as tools for the development of technology strategies.** The guidelines for national technology needs assessment adopted by the Commission on Sustainable Development in 1996 may be useful in developing such guidelines or manuals.

Notes

[1] The task managers for chapters 34-37 of Agenda 21 are as follows: Department of Economic and Social Affairs of the United Nations Secretariat for chapter 34 (Transfer of environmentally sound technology, cooperation and capacity-building); United Nations Educational, Scientific and Cultural Organization for chapters 35 (Science for sustainable development) and 36 (Promoting education, public awareness and training); and United Nations Development Programme for chapter 37 (National mechanisms and international cooperation for capacity-building in developing countries).

[2] See the Chairman's summary of the Roundtable on Business and Sustainability, hosted by European Partners for the Environment under the patronage of the European Council and the Commission of the European Communities (Brussels, 11 February 1998).

[3] See the summary report of the Technology Cooperation Workshop, held by the United Kingdom of Great Britain and Northern Ireland under the auspices of the Advisory Committee on Business and the Environment (London, 10 December 1997).